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Sturgeons in the Hungarian section of the Danube and draft program for their artificial propagation

by
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Abstract: In the Middle Ages, sturgeons were the most important subjects of Hungarian fisheries, but they became extreme rare by the end of 19th century. One species is only common in the Hungarian section of the Danube recently. The efficiency of the passive legal protection of sturgeons is a rather doubtful tool for the conservation of their populations. The artificial reproduction and the raising of Danubian sturgeons have already been developed, however interspecific androgenesis technology could provide a new, promising perspective in the restoration programs of species near to extinction.
Key words: Acipenseridae, androgenesis, conservation, restoration

Changes in sturgeon populations

Sturgeons have played an important role in the history of Hungarian fisheries. Most of the traditional fishing communities have been developed in the vicinity of spawning sites of anadromous sturgeons. In the Middle Ages, the great sturgeon (*Huso huso*) was one of the most important subjects of Hungarian fisheries. In the 18th century, the migrating stocks of great sturgeon decreased suddenly and by the second half of the 19th century it became an occasional catch. The great sturgeon captures had been interrupted after 1963 and after the construction of the Iron Gate barrage, it was a generally accepted view that this species would never return to the Hungarian waters. It was a great surprise, that a great sturgeon was caught from the Hungarian section of the Danube at Paks in 1987. Its length was 300 cm and its weight was 181 kg (Pintér 1991). Because of this specimen, the great sturgeon has been under protection in Hungary since 1989.

The fishery importance of the Russian sturgeon (*Acipenser gueldenstaedti*) was always less than that of the great sturgeon. From the end of the 19th century its sporadic catches were registered. The last specimens were recorded in the Hungarian section of the Danube in 1970 and 1997 (Pénzes 1970, Guti 1997). Though fishermen and anglers mention other specimens, these data can not be verified. The species has been under protection since 1989.

Stellate sturgeon (*Acipenser stellatus*) played a minor role in the fisheries of the Hungarian section of the Danube during the historical times. The last specimen was caught at Mohács in 1965 and the species is regarded as practically extinct in Hungary (Pintér 1991).

On the basis of historical records it seems impossible to evaluate the occurrence of ship sturgeon (*Acipenser nudiventris*), in general it has been confused with other sturgeon species. The largest specimen known in Hungary was taken from the Danube in 1932. It was 170 cm and 32 kg (Pintér 1991). In the second half of 20th century, a few specimens were found in the rivers of Hungary: Danube (Berke 1956), Tisza (Vásárhelyi 1957) and Drava (Pintér 1994). The species has been under protection since 1989.

Sterlet (*Acipenser ruthenus*) is the only common sturgeon species in Hungary and it plays an important role in the Danubian fisheries. On the basis of fishery catches population decrease was reported in the 1950s and 1960s (Jaczó 1974), but improvement was observed in the middle 1970s (Tóth 1979). The artificial enhancement of stocks with fry reared in hatcheries may contribute to the improvement of the population but the efficiency of stocking programs has not been investigated.

Artificial reproduction

The artificial reproduction and the raising of sturgeons have already been developed, but the artificial androgenesis technology could provide a new, promising perspective for their restoration programs. A method of interspecific androgenesis has been elaborated between goldfish (*Carassius auratus*) and common carp (*Cyprinus carpio*) in the Warmwater Fish Hatchery (TEHAG) at Százhalombatta and in University of Agricultural Sciences at Gödöllő (Bercsényi *et al.* 1996). In the experiments, carp eggs had been treated with gamma ray in order to inactivate the genetic material, and the eggs were fertilized with milt obtained from goldfish males, then a heat shock was performed for the duplication of the haploid chromosome set. The juvenile androgenic goldfish possessed all phenotypic recessive markers from their father, but none of the dominant alleles of the appropriate genes from carp. This was to demonstrate that the genetic material of fish sperms can be activated in irradiated eggs of another species and the maternal chromosomes are presumed to be totally excluded from the inheritance.

In the Warmwater Fish Hatchery, another promising experiment was carried out in 1996 (Bercsényi pers. com.). The intraspecific variety of androgenesis between a male albino and a female wild color sterlet was produced, juvenile sterlet showed recessive albino coloration. According to the results of this experiment, androgenesis would be an important technology in the artificial reproduction of Acipenseridae.

Conclusions

Interspecific androgenesis would have several advantages in the restoration programs of species near to extinction, as the Danubian sturgeons: 1) In the future, the shortage of eggs for the reproduction of a rare sturgeon species could easily be overcome, as high number of eggs could be obtained from a common sturgeon species. 2) One approach of preserving existing gene resources for the future is the long-term storage of gametes in deep frozen form. Experiments on fish egg cryopreservation have not been successful so far while sperm deep-freezing has already been solved without any problems, so the revitalization of a species near to extinction is possible, even if there is no female individual of the same species available. 3) The reproduction of sturgeons could be realized in a number of hatcheries far from the spawning areas without the special transportation needs of large size living adult specimens.

The efficiency of the passive legal protection of sturgeons is a rather doubtful tool for the conservation of their populations. A basic research program should be started on sturgeons in the Middle Danube with the following objectives: 1) The study of the annual movement patterns of *A. ruthenus, A. nudiventris* and *A. gueldenstaedti* and the identification of their

critical feeding and spawning habitats. 2) The verification of the theoretical concept of non-anadromous populations of *A. nudiventris* and *A. gueldenstaedti* in the Middle Danube. 3) Obtain information on movements of restocked *A. ruthenus.* 4) Elaborate the technology of interspecific androgenesis for Acipenseridae and to establish a deep-frozen gene bank (cryopreserved sperm) for restoring Danubian sturgeons. The results of these preliminary researches could contribute a more complex restoration program of Danubian sturgeons.

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